4.6 Waste Reduction Operations Complex, Power Burst Facility, and Auxiliary Reactor Area

The Waste Reduction Operations Complex (WROC), Power Burst Facility (PBF), and Auxiliary Reactor Area (ARA) are located fairly close together in the south-central portion of the INEEL Site and were all experimental reactor facilities built in the 1950s.

The ARA-I facility was built in 1957 to support the Stationary Low-Power Reactor No. 1 (SL-1). The SL-1 reactor was built in 1957 and operated intermittently from 1958 until it was destroyed by an accident in January 1961. The ARA facility housed several Army Reactor Program experiments until the program was phased out in 1965. The main buildings at ARA-II were converted to offices and welding shops. The ARA-II facility also housed several minor structures, such as a guardhouse, a well house, a chlorination building, a decontamination and laydown building, a power extrapolation building, an electrical substation, and several storage tanks. The ARA-I and ARA-II facilities were formally shut down in 1988 and 1986, respectively. Decontamination and complete dismantlement were initiated in 1995 and have been completed. Construction of the ARA-III facility was completed about 1959 to house the Army Gas Cooled Reactor Experiment research reactor. Experiments with the reactor continued until the plant was deactivated in 1961. In 1963, the ARA-IV facility was modified to support the Mobile Low-Power Reactor series of tests conducted at ARA-IV and remained active until late 1965 when the army reactor program was phased out. In 1969, two buildings were constructed at ARA-III to provide additional laboratory and office space in support of other INEEL programs. The facility was shut down in 1989. Decontamination and complete dismantlement was initiated in 1990 and completed in 1999. The ARA-IV facility was build to accommodate the Mobile Low-Power Reactor I, an active project from 1957 to 1964. The Nuclear Effects Reactor was operated at ARA-IV from 1967 to 1970. The area was closed down until 1975, at which time it was used temporarily for some welding qualification work. DD&D was performed in 1984 and 1985. Since 1985, the area has been used occasionally for testing explosives in powered-metal manufacture experiments. A small control building, a bunker, the buried remains of two leach pits, and a sanitary waste system are all that remain.

PBF and the Control Area were originally built in the late 1950s for remote control of Special Power Excursion Reactor Test (SPERT) experiments. Later, the PBF reactor was constructed in 1972, put on standby in 1985, and shut down in 1998. Fuel was recently removed from the reactor pools and is now in dry storage at INTEC. Cleanup activities are scheduled to be complete by 2012. The Control Area facilities provide raw water storage and distribution, administrative offices, instrument and mechanical work areas, and data acquisition resources.

The buildings that currently house WROC were originally built to contain the SPERT reactors. The SPERT reactor tests involved four reactors. SPERT-I reactor was operated from 1955 to 1964. It was decommissioned in 1964 and demolished in 1985. The SPERT-II reactor was operated from 1960 to 1964. After the reactor was removed, the facility was converted for research purposes. The SPERT-II area is also used for temporary storage of uncontaminated lead. The lead is stored outside in cargo containers stacked on asphalt pads. The SPERT-III reactor was constructed in the late 1950s and operated from 1958 to 1968. The reactor building was decontaminated in 1982, and the building was modified to contain the Waste Experimental Reduction Facility Incinerator (see Figure 4-6). All four SPERT reactor vessels are buried in the RWMC. Decontamination and dismantlement of the incinerator was completed in 2003, and the RCRA closure certification was approved by the State of Idaho on October 7, 2003. The SPERT-IV reactor was operational from 1961 to 1970. After the reactor was removed, the building was converted to a mixed waste storage facility. All waste stored in the building was removed in September 2003, and the facility will undergo RCRA closure in 2004. Various reactor areas have housed secondary missions, including reduction of low-level radioactive waste, development of waste treatments, storage of waste, incineration of waste, and laboratory operations.

Three RODs and two time-critical removal actions have been completed at ARA and PBF. The OU 5-05 and 6-01 ROD (INEEL 1996), which addressed the ARA-06 SL-1 Burial Ground and 10 additional sites, was implemented in 1996. The *Power Burst Facility Record of Decision: Power Burst Facility Corrosive Waste Sump and Evaporation Pond, Operable Unit 5-13, Waste Area Group 5* (DOE-ID 1992c) addressed the PBF-08 Corrosive Waste Sump and the PBF-10 Evaporation Pond. Remediation of these areas was completed in 1994. The *Record of Decision: Auxiliary Reactor Area-1 Chemical Evaporation Pond, Operable Unit 5-10* (DOE-ID 1992d) addressed the ARA-01 Chemical Evaporation Pond.

Figure 4-6. Aerial view of the Waste Experimental Reduction Facility with the Control Area shown in the distance.

Fifty-five sites of known or suspected contaminant release were evaluated in the OU 5-12 comprehensive ROD completed in February 2000. The *Record of Decision for the Power Burst Facility and Auxiliary Reactor Area, Operable Unit 5-12* (DOE-ID 2000c) identified five contaminated soil sites (ARA-01, ARA-12, ARA-23, ARA-25, and PBF-16), one sanitary waste system site (ARA-02), and one radionuclide tank site (ARA-16) as requiring remediation.

In addition to the CERCLA cleanup activities, a release investigation of a heating fuel release near building PER-620 is being conducted in accordance with Idaho's *Risk-Based Corrective Action Guidance Document for Petroleum Releases* (IDEQ 1996). The PER-722 underground storage tank is located immediately next to and on the north side of the PBF reactor building (PER-620). The tank is a 10,000-gal, single-walled carbon steel tank that was used to supply heating fuel to PBF-620. The tank was installed in 1971 and had been in continual use until the discovery of a possible leak in June 2002. During routine gauging of the tank, a decrease in product level was observed, and a release was reported to the IDEQ. Following removal of the remaining product from the tank, a state-certified vendor performed a tank-tightness determination on June 28, 2002. The results of that test confirmed the presence of a leak in

PER-722. Engineering calculations indicate that as much as 17,000 gal of product may have leaked into the subsurface between November 1999 and June 2002.

The contaminants of potential concern include those associated with No. 2 diesel fuel and include benzene, toluene, ethyl benzene, and xylenes and polynuclear aromatic hydrocarbons, including acenapthene, anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, benzo(g,h,i)perylene, chrysene, fluorene, fluoranthene, naphthalene, phenanthrene, and pyrene. In April 2003, a single core hole was installed near the PER-722 tank to a depth of 140 ft below land surface. Evidence of diesel contamination was present in the core and continued to the bottom of the coring. Based on review of the data collected from the core hole, the IDEQ has requested additional characterization to further define the extent of contamination into the underlying basalt and sedimentary interbeds and to determine if an impact to the Snake River Plain Aquifer may exist. The results of the additional characterization will determine if further action may be warranted.

4.6.1 Current State

A map showing the current state of this area is included as Figure 4-6a1. To date, remedial actions at sites ARA-02, ARA-16, ARA-25, and PBF-16 have been completed. Remedial actions at sites ARA-01, ARA-12, and ARA-23 will be completed by 2005. Site ARA-01 will be remediated to address human health risks from arsenic and potential risks to ecological receptors from exposure to selenium and thallium. Site ARA-12 will be remediated to address human health risks from silver-108m and cesium-137 and ecological risks from copper, mercury, and selenium in surface and subsurface soil. An area of elevated gamma activity to the southwest of the site also will be remediated. Site ARA-23, which includes the radiological contaminated soil around ARA-I and ARA-II, the remaining reactor foundation, and remaining underground utilities within the facility fences, will be remediated to address the human health risks from cesium-137. A conceptual site model that represents the current state conditions is provided as Figure 4-6a2.

Currently, institutional controls are maintained at the following sites:

- ARA-01 ARA-I (Chemical Evaporation Pond). The COCs are arsenic and potential risks to ecological receptors from exposure to selenium and thallium.

- ARA-02 ARA-I (Sanitary Waste System). The COCs were lead, Aroclor-1242, radium-226, cesium-137, uranium-235, and uranium-238.

- ARA-03 ARA-I (lead sheeting pad near ARA-627). The COC was cesium-137. Soil was removed as part of the DD&D of ARA-I and disposed of at the RWMC. Because of the presence of cesium-137, the site has been restricted to industrial use with institutional controls.

- ARA-06 ARA-II (Stationary Low-Power Reactor No. 1 Burial Ground). In 1996, a remedial action consisting of an engineered barrier was implemented because of exposure to radiological contaminated soil and waste from the 1961 SL-1 reactor accident and cleanup.

- ARA-07 ARA-II (Seepage Pit to East) (ARA-720A). No COCs were identified for this site; however, based on historical analytical data, residual cesium-137 contamination that warrants institutional controls exists.

- ARA-08 ARA-II (Seepage Pit to West) (ARA-720B). No COCs were identified for this site; however, based on historical analytical data, residual cesium-137 contamination that warrants institutional controls exists.

- ARA-12 ARA-III (Radioactive Waste Leach Pond). The COCs are silver-108m and cesium-137.

- ARA-16 ARA-I (Radionuclide Tank). The soil COC was cesium-137.

- ARA-23 (radiological contaminated surface soil around ARA-I and ARA-II). The COC is cesium-137.

- ARA-24 ARA-III (windblown soil). A contaminated pipeline embedded in concrete 20 ft below grade remains.

- ARA-25 ARA-I (soil beneath the ARA-626 Hot Cells). The COCs were arsenic, cesium–137, and radium-226. There are potential risks to ecological receptors from exposure to copper and lead.

- PBF-10 PBF (Reactor Area Evaporation Pond) (PBF-733). The COC was cesium-137. An interim action was completed in 1994 and in 1995 when the pond liner was removed, the berm was pushed into the pond, and the area was graded and seeded with native grass.

- PBF-12 PBF SPERT-I (Leach Pond). The COC was cesium-137.

- PBF-13 PBF (Reactor Area Rubble Pit). There is no unacceptable risk, but the site contains construction waste, possibly friable asbestos.

- PBF-21 PBF SPERT-III (Large Leach Pond). The COCs were cesium-137 and uranium-238. The contamination is covered by an 8-ft-thick layer of soil.

- PBF-22 PBF SPERT-IV (Leach Pond) (PBF-758). The COC was cesium-137.

- PBF-26 PBF SPERT-IV (lake). The COCs were arsenic, Aroclor-1254, cesium-137, uranium-235, and uranium-238.

There are still open VCO actions at PBF. These will be completed in 2004.

4.6.2 End State

A map and conceptual site model showing anticipated conditions at the end state are included as Figures 4-6b1 and Figure 4-6b2.

Following the first 5-year remedy effectiveness review in 2005, it is anticipated that maintenance of institutional controls at five of the sites that have been remediated (ARA-01, ARA-02, ARA-12, ARA-16, and ARA-23) will be discontinued. Because of its proximity to the ARA-23 site, contaminated soil that comprises ARA-03 may very well be remediated by default, thereby negating the need for institutional controls. Institutional controls were never a requirement for PBF-16.

Remediation of all sites will be completed by 2005. However, institutional controls to restrict access will be required in 2035 at the following sites because of continued radionuclide contamination, unless a 5-year remedy effectiveness review determines that institutional controls are no longer required:

- ARA-06 ARA-II (Stationary Low-Power Reactor No. 1 Burial Ground)
- ARA-07 ARA-II (Seepage Pit to East) (ARA-720A)
- ARA-08 ARA-II (Seepage Pit to West) (ARA-720B)
- ARA-24 ARA-III (windblown soil)
- ARA-25 ARA-I (soil beneath ARA-626 Hot Cells)
- PBF-10 PBF (Reactor Area Evaporation Pond) (PBF-733)
- PBF-12 PBF SPERT-I (Leach Pond)
- PBF-13 PBF (Reactor Area Rubble Pit)
- PBF-21 PBF SPERT-III (Large Leach Pond)
- PBF-22 PBF SPERT-IV (Leach Pond) (PBF-758)
- PBF-26 PBF SPERT-IV (lake).

The WROC area is expected to have a long-term mission supporting various NE programs.

4.6.3 Variances

A potential variance related to cleanup of the three remaining ARA sites has been identified and is described in Table 5-1. The ROD selected remedy was based on scenarios that included residential receptors after 100 years. It is proposed that an evaluation be conducted to determine the level of cleanup that would be required to protect occupational receptors, assuming no future residential use of the ARA sites and surrounding area.

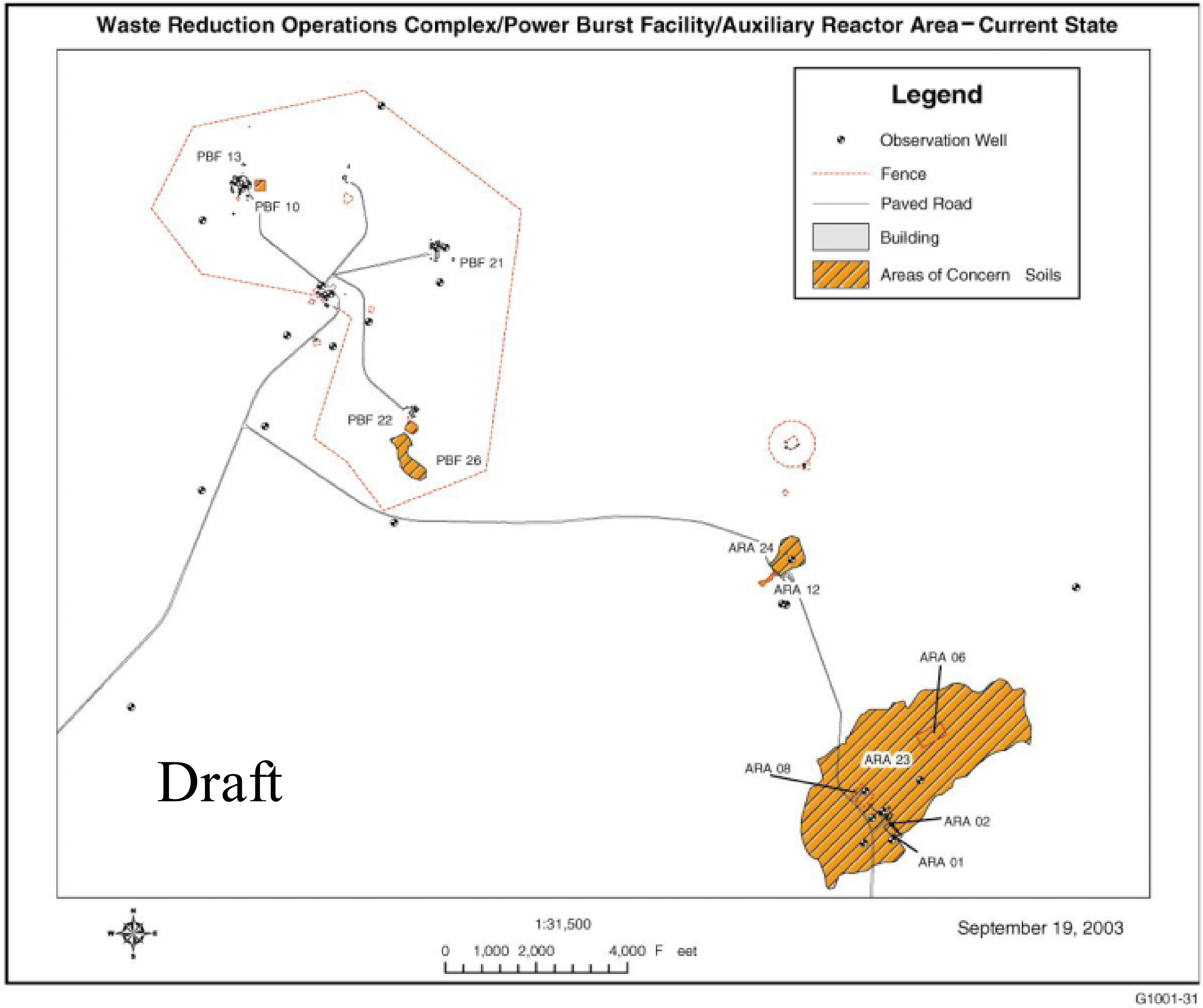

Figure 4-6a1. Waste Reduction Operations Complex, Power Burst Facility, and Auxiliary Reactor Area map—current state.

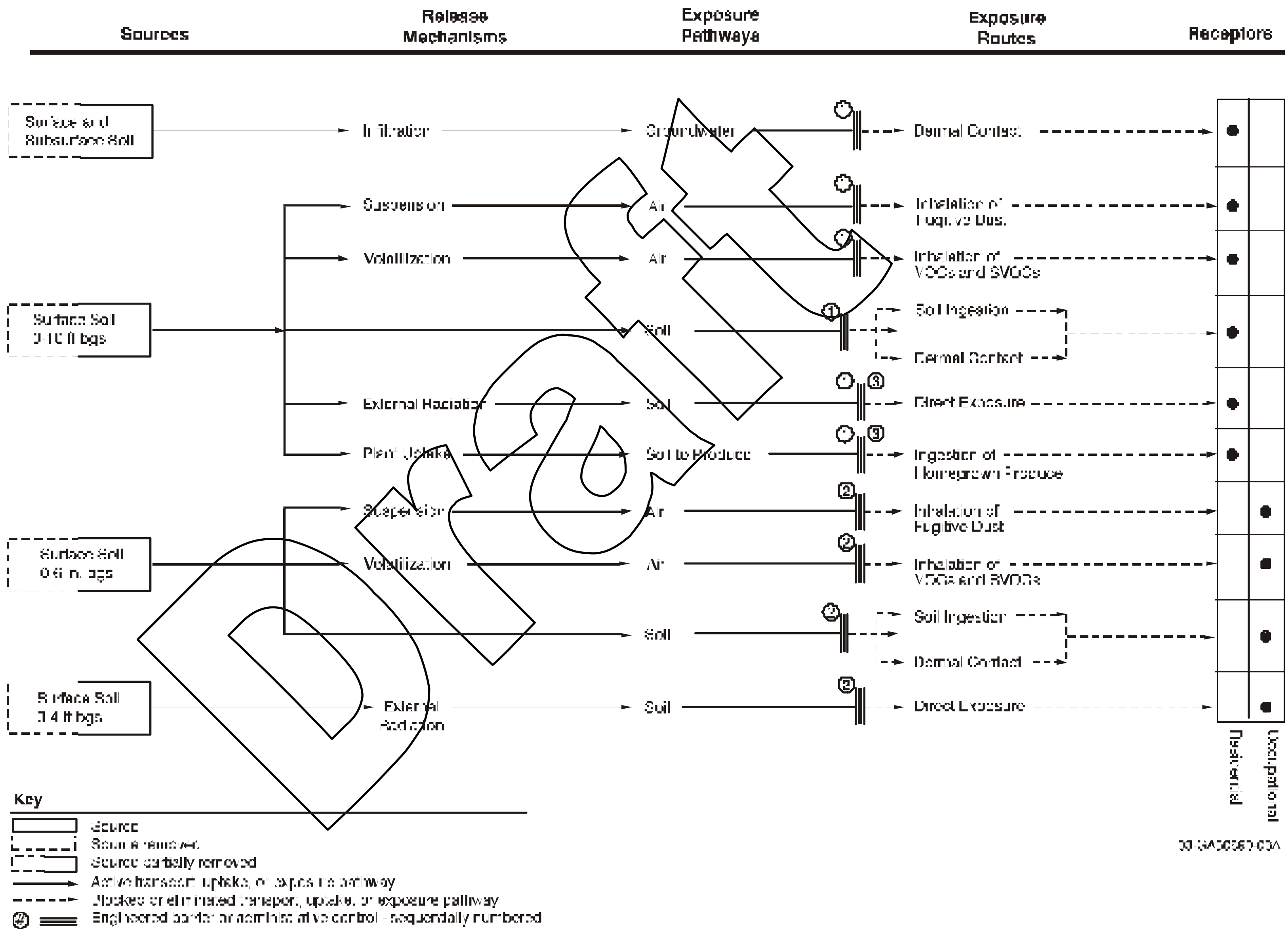

Figure 4-6a2. Waste Reduction Operations Complex, Power Burst Facility, and Auxiliary Reactor Area conceptual site model—current state.

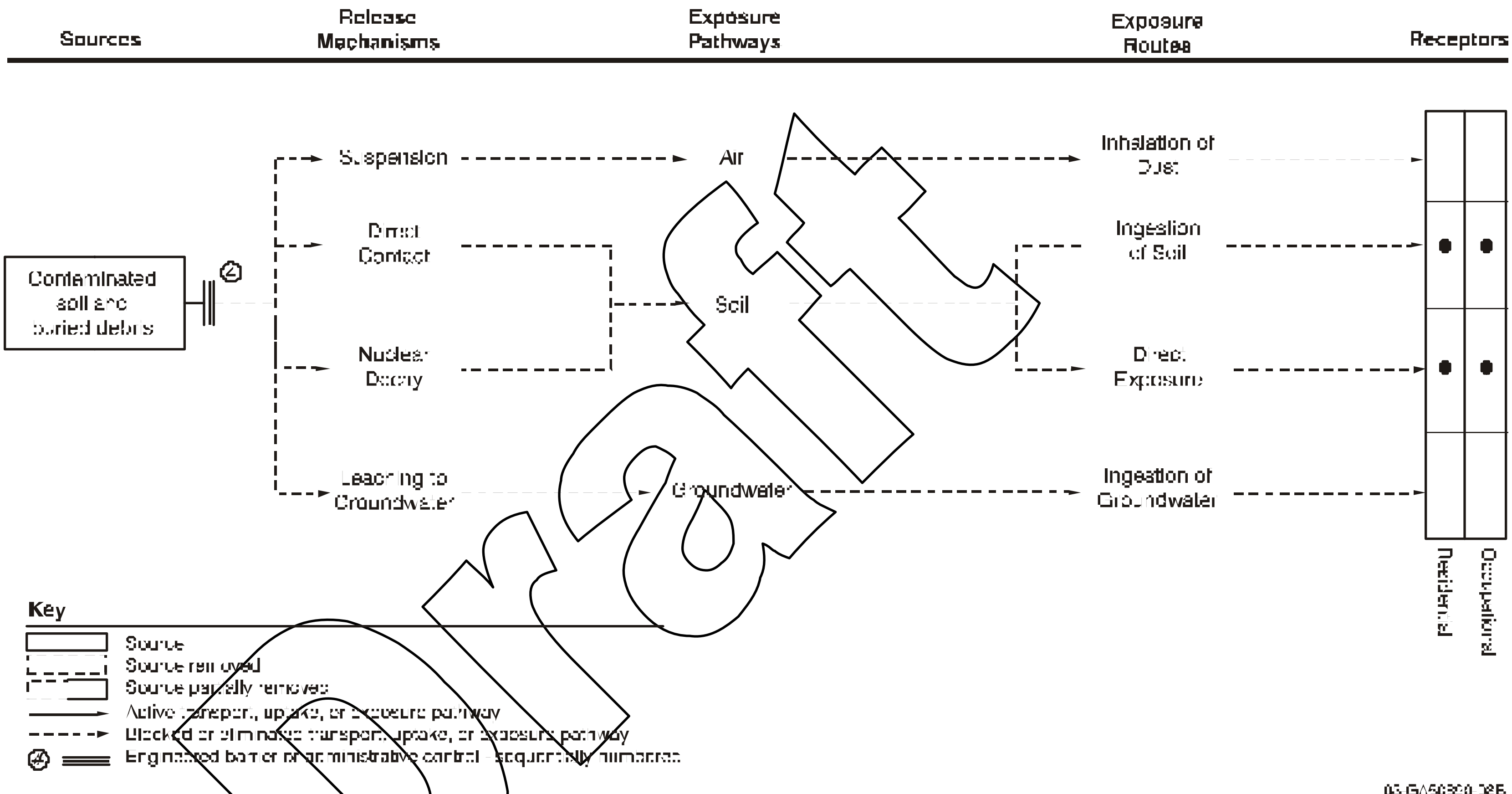

Figure 4-6a2 (continued). Waste Reduction Operations Complex, Power Burst Facility, and Auxiliary Reactor Area conceptual site model—current state.

SVOC = semivolatile organic compound

Narrative for Figure 4-6a2 Waste Reduction Operations Complex, Power Burst Facility, and Auxiliary Reactor Area Conceptual Site Model—Current State

All remedial actions have been completed, except for sites ARA-01, ARA-12, and ARA-23. All remedial actions will be completed by 2005. Site ARA-01 will be remediated to address human health risk from arsenic and potential risks to ecological receptors from exposure to selenium and thallium. Site ARA-12 will be remediated to address human health risks from silver-108m and cesium-137 and ecological risks from copper, mercury, and selenium in surface and subsurface soil. An area of elevated gamma activity to the southwest of the site also will be remediated. Site ARA-23, which includes the radiological contaminated soil around ARA-I and ARA-II and the remaining reactor foundation and the remaining underground utilities within the facility fences, will be remediated to address the human health risks from cesium-137.

The steps taken to mitigate or remove these hazards are as follows:

1. Institutional controls are in place at sites ARA-01, ARA-12, and ARA-23 until remediation is implemented as prescribed in the ROD. The selected remedial action for these sites is removal and on-Site disposal at the ICDF. The estimated volume of contaminated soil is 1,373,243 ft^3. Institutional controls are maintained at 14 other sites that have been remediated.

   The entire INEEL Site has restricted access to prevent intrusion by the public. Workers are protected through posting of signs at contaminated sites, by recording contaminated sites in the Site institutional controls database, and through the work control process used to identify hazards and mitigation measures for planned work activities.

2. Workers are protected from direct exposure to radionuclide contamination through institutional controls. These controls include posting of signs at contaminated sites, radiological training, and work control processes used to identify hazards and mitigation measures for planned work activities.

3. The entire INEEL Site has restricted access to prevent intrusion by the public. Visible access restrictions (warning signs) are in place at sites with institutional controls.

4. For the SL-1 Reactor Burial Ground, containment by capping with an engineered long-term barrier provides overall protection of human health and the environment. Isolation both inhibits migration of contaminants from the burial ground and allows time for radioactive decay of the primary contributor to the overall risk (i.e., cesium-137 and progeny). The risk diminishes to 1E-04 in approximately 400 years.

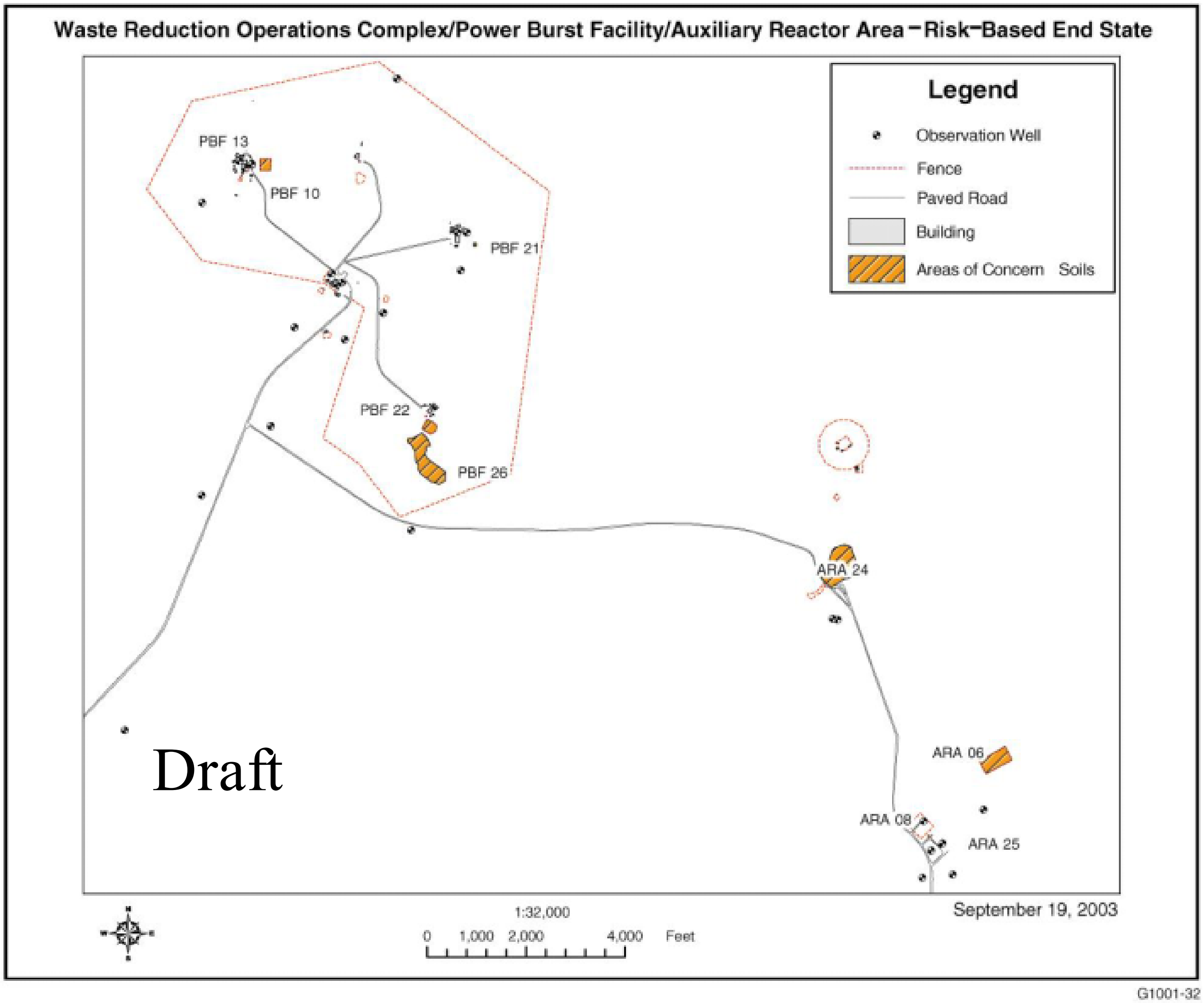

Figure 4-6b1. Waste Reduction Operations Complex, Power Burst Facility, and Auxiliary Reactor Area map—risk-based end state.

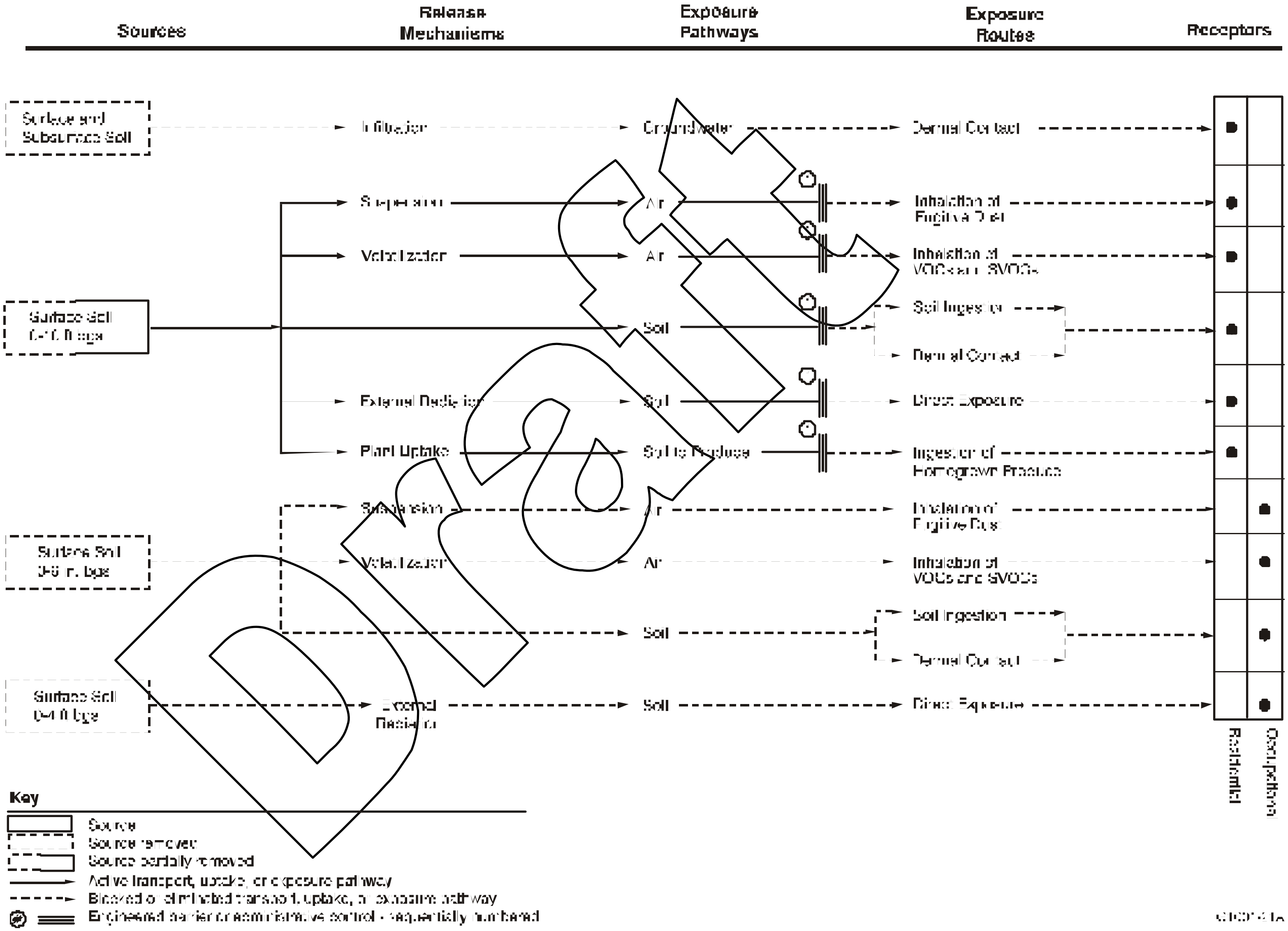

Figure 4-6b2. Waste Reduction Operations Complex, Power Burst Facility, and Auxiliary Reactor Area conceptual site model—risk-based end state.

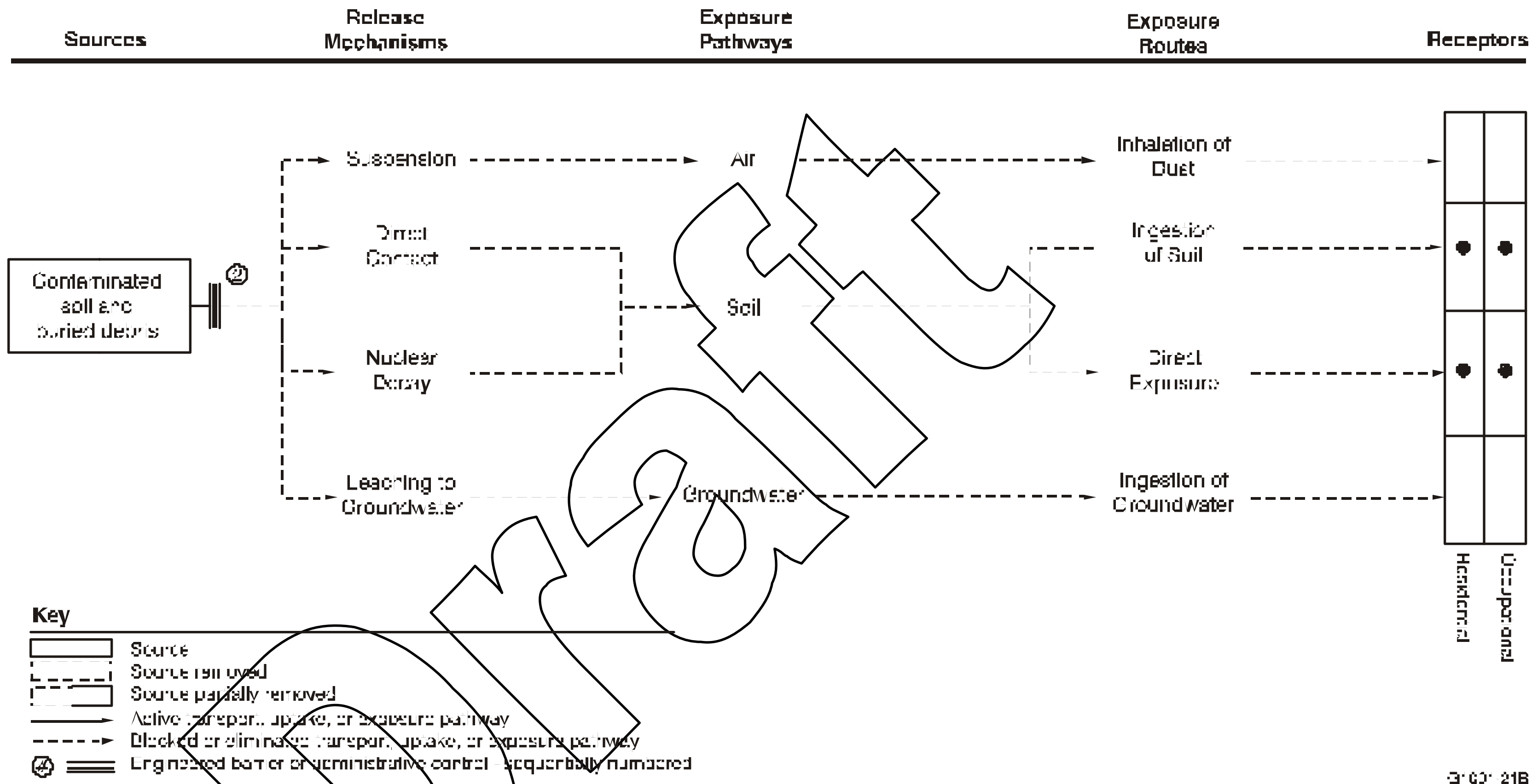

Figure 4-6b2 (continued). Waste Reduction Operations Complex, Power Burst Facility, and Auxiliary Reactor Area conceptual site model—risk-based end state.

SVOC = semivolatile organic compound

Narrative for Figure 4-6b2 Waste Reduction Operations Complex, Power Burst Facility, and Auxiliary Reactor Area Conceptual Site Model—Risk-Based End State

Remediation of all sites will be completed by 2005. Institutional controls at sites ARA-06, ARA-07, ARA-08, ARA-24, ARA-25, PBF-10, PBF-12, PBF-13, PBF-21, PBF-22, and PBF-26 will be required because of continued radionuclide contamination, unless a 5-year remedy effectiveness review determines that institutional controls should not be maintained.

The steps taken to mitigate or remove these hazards are as follows:

1. The entire INEEL Site has restricted access to prevent intrusion by the public. Workers are protected through posting of signs at contaminated sites, by recording contaminated sites in the Site institutional controls database, and through the work control process used to identify hazards and mitigation measures for planned work activities.

2. For the SL-1 Reactor Burial Ground, containment by capping with an engineered long-term barrier provides overall protection of human health and the environment. Isolation both inhibits migration of contaminants from the burial ground and allows time for radioactive decay of the primary contributor to the overall risk (i.e., cesium-137 and progeny). The risk diminishes to 1E-04 in approximately 400 years.